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Review Article

Small Ruminant Production in Sub-Saharan Africa: Goat and Sheep Feeding, Breeding, Health, Peste des Petits Ruminants Control, and Markets for Smallholder Livelihoods

Ifeanyi C. Nwosu[1], Grace A. Owusu[2], Musa D. Bello[1]

[1] *Department of Animal Science, University of Ibadan, Ibadan, Nigeria*

[2]*Department of Animal Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*

Corresponding author: Ifeanyi C. Nwosu — ifeanyi.nwosu@ui.edu.ng

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Abstract

Sheep and goats are the most widely kept livestock in sub-Saharan Africa (SSA), providing meat, milk, manure, income, and a living savings account for millions of smallholders, especially women and youth (FAO, 2023; Kosgey and Okeyo, 2007). Despite their large numbers, productivity is low, mainly because of diseases, poor feed, and inferior breeds (Desta et al., 2023; FAO, 2023). This article synthesises peer-reviewed evidence published between 2000 and 2025 on small ruminant production in SSA, with emphasis on indigenous goats and sheep, feeding and supplementation, breeding and genetic improvement, health and peste des petits ruminants (PPR), and markets. Evidence shows that disease and parasite infestation is the most commonly identified constraint to small ruminant production in Ethiopia, Tanzania, and Uganda, and that PPR can kill up to 90 percent of infected animals in naive populations, with a global target for eradication by 2030 (FAO, 2023; WOAH, 2023). Supplementation trials show that increasing concentrate or legume supplementation increases liveweight gain, with maximum gain at higher levels of groundnut cake and cassava flour in West African Dwarf goats, and with 250 to 600 g per day of concentrate in Boer crossbred goats in Ethiopia. Community-based breeding, vaccination, and market linkage programmes have been shown to improve growth, survival, and income, but adoption depends on feed, veterinary services, and market access. The article proposes a practical, low-cost small ruminant system for smallholders, including improved feeding, strategic deworming and vaccination, record keeping, and fattening for market, and it identifies priorities for veterinary services, feed, breeding, and markets. The central argument is that small ruminants should not be treated as a low-input, low-output fallback, but as a high-return, fast-reproducing enterprise that, with modest investment in feed, health, and breeding, can lift household income, nutrition, and resilience faster than any other livestock species.

Keywords: small ruminants; goats; sheep; peste des petits ruminants; feeding; breeding; sub-Saharan Africa

1. Introduction

A goat is a bank that walks. For a smallholder who cannot access formal credit, a goat or sheep can be sold in hours to pay school fees, medical bills, or seed, can be given as a gift or dowry, and can be kept as insurance against crop failure (Kosgey and Okeyo, 2007; FAO, 2023). Goats and sheep are also more accessible than cattle: they cost less, require less land, reproduce faster, and can be managed by women, youth, and older farmers. In Nigeria, small ruminants contribute an estimated 35 percent of total meat supply, and in Ethiopia there are about 25 million sheep and 22 million goats, with similar large populations across SSA.

Yet small ruminant productivity is far below potential. Average daily gain is often 30 to 50 grams per day, kidding and lambing rates are low, mortality is high, especially in kids and lambs, and off-take is low (Desta et al., 2023). The reasons are well-known: poor feed,

especially in the dry season, diseases such as PPR, sheep and goat pox, contagious caprine pleuropneumonia (CCPP), and helminth parasites, poor breeding, and weak markets. These constraints are not inevitable; they are management problems that can be solved with low-cost, locally available practices.

This article asks three questions. First, which breeds and systems are most suitable for smallholders in SSA? Second, how do feeding, health, and breeding affect growth, survival, and profit? Third, what support, in veterinary services, feed, markets, and extension, makes small ruminant production more productive and more equitable, especially for women? The synthesis concentrates on goats, where evidence is strongest, while drawing on sheep where relevant.

2. Breeds, Systems and the Role of Indigenous Goats

Indigenous goats, such as the West African Dwarf (WAD), East African, Sahelian, and Boer crossbreds, dominate SSA production. WAD goats are small, hardy, trypanotolerant, and prolific, but they grow slowly, with adult weights of 20 to 30 kg. Sahelian goats are larger, with adult weights of 30 to 40 kg, and are better for meat and milk. Boer goats, originally from South Africa, are larger and faster-growing, and Boer crossbreds have been used to improve growth in Ethiopia, Kenya, and Nigeria, with crossbred yearlings reaching 19 kg and gaining more with concentrate supplementation (Kosgey and Okeyo, 2007).

Production systems vary: pastoral, agro-pastoral, and mixed crop-livestock. In pastoral systems, goats and sheep graze on communal rangelands, moving with water and forage. In agro-pastoral systems, they graze on crop residues, fallows, and common land, with some supplementation. In mixed systems, they are kept in confinement or semi-confinement, fed crop residues, legumes, and concentrates, and their manure fertilises crops. Each system has advantages: pastoral systems use marginal land, mixed systems recycle nutrients, and confinement reduces theft, predation, and disease transmission.

Indigenous breeds should not be replaced wholesale. They are adapted to heat, disease, poor feed, and local markets, and they have traits, such as trypanotolerance, prolificacy, and disease resistance, that exotic breeds lack (Kosgey and Okeyo, 2007). The best strategy is selective breeding within indigenous breeds, combined with strategic crossbreeding with Boer or other improved breeds where feed and health are adequate. Community-based breeding programmes, where farmers collectively select breeding males, keep records, and share rams and bucks, have been shown to improve growth and survival while maintaining adaptation.

3. Feeding and Supplementation: The Biggest Lever

Feed is the biggest lever for small ruminant productivity, because most goats and sheep in SSA are underfed, especially in the dry season when grass is scarce, low in protein, and high in fibre (Desta et al., 2023). Supplementation with legumes, concentrates, and crop residues can increase growth, milk, and reproduction, and can reduce mortality. A trial with WAD goats in Nigeria found that each increment in groundnut cake and cassava flour increased liveweight gain, with maximum gain at higher levels of both supplements. A trial in Ethiopia with Boer crossbred goats found that increasing concentrate from 250 to 600 g per day increased intake, weight gain, and economic viability for fattening, with 350 to 450 g per day often the most profitable level when feed cost is considered.

Legume supplementation is especially valuable because it is low-cost and locally available. Supplementing Panicum maximum grass with Stylosanthes, Lablab, Aeschynomene, or Centrosema increased weight gain, nutrient digestibility, and nitrogen balance in WAD goats. Tree leaves, such as Gliricidia, Leucaena, and Terminalia, can provide protein, reduce methane, and improve growth, as shown in a trial at Bahir Dar University in Ethiopia where Terminalia brownii leaf meal improved growth while reducing methane emissions. Crop residues, such as maize stover, groundnut haulms, and cassava peels, can be treated with urea or supplemented with legumes to improve digestibility.

Practical feeding should be seasonal: flush feeding before mating to improve conception, supplementary feeding in late pregnancy to improve kid birth weight and survival, and creep feeding for kids to improve weaning weight. Water should be available daily, clean, and close to housing, because dehydration reduces feed intake, growth, and milk. Mineral licks, with salt, calcium, and phosphorus, should be provided, especially for pregnant and lactating does and ewes.

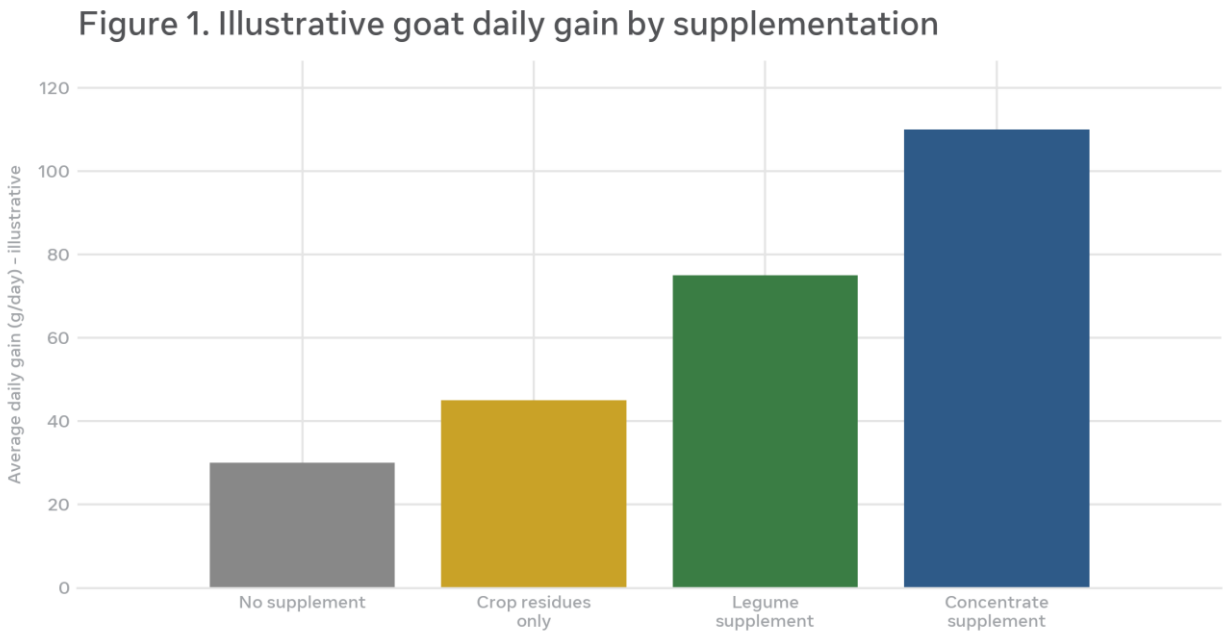


Figure 1. *Illustrative goat average daily gain by supplementation level. Legume and concentrate supplementation substantially increase gain compared with no supplement or crop residues alone.*

4. Health: PPR, Parasites and Vaccination

Health is the second biggest lever, and the most urgent. Disease and parasite infestation was the most commonly identified constraint to small ruminant production in a systematic review of Ethiopia, Tanzania, and Uganda (Desta et al., 2023). Peste des petits ruminants (PPR), also called goat plague, is a highly contagious viral disease that affects sheep and goats, causing fever, mouth sores, diarrhoea, and pneumonia, and killing up to 90 percent of infected animals in naive populations (FAO, 2023; WOAH, 2023). PPR has been targeted for global eradication by 2030, following the eradication of rinderpest, and vaccination with the Nigeria 75/1 strain provides three years of protection from a single dose.

Other major diseases include sheep and goat pox, which cause skin lesions and mortality, contagious caprine pleuropneumonia (CCPP), which causes pneumonia in goats, and clostridial diseases such as enterotoxaemia and tetanus. Helminth parasites, especially Haemonchus contortus, cause anaemia, weight loss, and mortality, especially in kids and lambs, and they are the most common cause of slow growth. External parasites, such as ticks, lice, and mange, also reduce growth and skin quality.

Prevention is cheaper than treatment. A practical health calendar includes: PPR vaccination for kids at 4 months and for all animals in campaigns, sheep and goat pox vaccination where endemic, CCPP vaccination in goats where endemic, strategic deworming at the start of the rains and at weaning, with rotation of anthelmintics to reduce resistance, and tick control where needed. Farmers should quarantine new animals for two weeks, isolate sick animals, disinfect housing, and report outbreaks to veterinary services promptly. In Borana, Ethiopia, post-vaccination sero-conversion for PPR was 93.23 percent, showing that vaccination can achieve high flock immunity when cold chain and coverage are adequate. New thermotolerant vaccines, such as OvipestePlus developed by ILRI and partners in Mali, and multivalent vaccines protecting against PPR, sheep and goat pox, and CCPP in one shot, as launched in Kenya, offer hope for easier delivery in hot, remote areas.

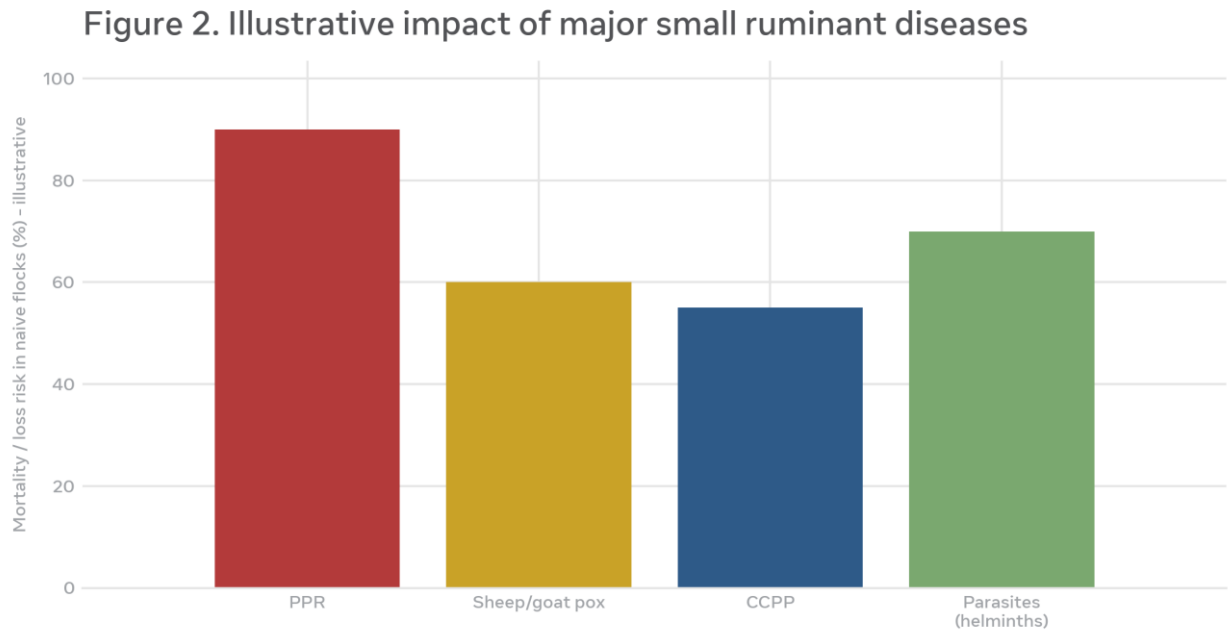


Figure 2. *Illustrative impact of major small ruminant diseases. PPR is the most destructive, but parasites, pox, and CCPP also cause large losses if not controlled.*

Table 1. Major small ruminant health problems and their control.

Disease / problem	Signs	Prevention / control
PPR (goat plague)	Fever, mouth sores, diarrhoea, pneumonia	Vaccinate, Nigeria 75/1, 3-yr protection
Sheep / goat pox	Skin lesions, fever	Vaccinate where endemic
CCPP	Pneumonia in goats	Vaccinate, isolate sick
Helminths	Anaemia, weight loss, bottle jaw	Strategic deworming, rotate drugs
Ticks / mange	Skin lesions, anaemia	Acaricide, hygiene
Enterotoxaemia	Sudden death, diarrhoea	Vaccinate, avoid overfeeding

Note: Adapted / summarised from the sources cited in the text. PPR = peste des petits ruminants; CCPP = contagious caprine pleuropneumonia.

5. Breeding, Reproduction and Record Keeping

Reproduction is the engine of small ruminant production. A doe that kids twice in 14 months, with twins each time, produces four kids per year, while a doe that kids once a year with a single kid produces one. Management can improve reproduction: flushing before mating, good nutrition in late pregnancy, and reducing kid mortality through colostrum, housing, and health. Kidding intervals should be 8 to 10 months, litter size 1.5 to 2.0 for goats, and kid survival above 85 percent for a profitable flock.

Breeding should be based on records, not on appearance alone. Farmers should record dam, sire, birth date, birth weight, weaning weight, and health for each animal, and should select breeding females from dams with twins, good milk, and good mothering, and breeding males from dams with high growth and survival. Inbreeding should be avoided by exchanging bucks and rams between flocks, and by not using the same male for more than two seasons in the same flock. Castration of non-breeding males at 3 to 4 months can improve growth, reduce aggression, and improve meat quality.

Fattening for market is a profitable strategy. Young males, 6 to 12 months old, can be fattened for 60 to 90 days with concentrate supplementation, legumes, and crop residues, to reach market weight of 25 to 30 kg for goats and 30 to 40 kg for sheep, especially before festivals such as Eid, Christmas, and Easter when prices are high. A fattening trial in Ethiopia aimed to achieve 30 kg market weight for long-eared Somali goats with a feed of wheat bran, noug cake, and salt, showing that local feeds can achieve market weight with training and supplementation.

6. Economics, Gender, Markets and Adoption

Economics must be explicit. A goat costs tens to hundreds of dollars, depending on breed, age, and market, while feed, health, and housing costs are modest. The return comes from sale of kids, milk, manure, and skins, and from the savings and insurance value of the flock. A study in Ilorin West, Nigeria, found that goat and sheep production was profitable for smallholders, with gross margin and net return positive,

and that socio-economic factors, such as experience, education, and access to credit, influenced profitability. Fattening for festivals can increase returns by 20 to 40 percent compared with selling at other times, because demand and prices spike.

Markets are as important as production. Goats and sheep are sold in local markets, to traders, and to butchers, often with little grading, weighing, or price information. Farmers who sell individually, in small numbers, and in distress, receive lower prices than those who sell in groups, with weighing, and at peak demand. Cooperatives, savings groups, and market linkage programmes can help farmers negotiate better prices, access transport, and plan sales. Women dominate small ruminant ownership and management in many SSA households, yet they may not control sale decisions or income. Programmes that channel goats, training, and credit through women's groups, and that ensure women have rights to animals and income, are more likely to reach those who actually manage flocks and to sustain adoption.

Table 2. Small ruminant production systems in SSA.

System	Typical flock	Feeding	Suitability
Pastoral	50-200 head	Grazing, communal	Arid / semi-arid, mobile
Agro-pastoral	10-50 head	Grazing + residues	Semi-arid, mixed farms
Mixed crop-livestock	5-20 head	Residues + supplement	Sub-humid, small farms
Confinement / fattening	5-20 head	Cut-and-carry + concentrate	Peri-urban, market-oriented

Note: Adapted / summarised from the sources cited in the text. PPR = peste des petits ruminants; CCPP = contagious caprine pleuropneumonia.

7. Research and Policy Priorities

Several gaps remain. First, long-term, multi-location trials that measure not only growth but also reproduction, survival, income, and nutrition over multiple seasons are still scarce. Second, research on low-cost, locally formulated feeds, including tree leaves, legumes, and by-products, should be prioritised, because feed is the largest cost after health. Third, research on PPR eradication, on thermotolerant and multivalent vaccines, and on delivery in remote areas, should be embedded in veterinary services, not treated as separate projects. Fourth, research on community-based breeding, on gender, and on markets should be embedded in small ruminant programmes, not treated as separate.

Policy should align incentives with small ruminant productivity. Public investment should support veterinary services, cold chains, and vaccination campaigns, with PPR eradication as a priority. Feed and fodder systems should be supported, with community fodder banks, legume seed, and feed formulation training. Extension should teach feeding, health, breeding, and record keeping, not only animal purchase. Market linkages, including weighing, grading, and transport, can ensure that higher production translates into higher income, not lower prices from gluts (FAO, 2023).

8. Conclusion

Small ruminants offer a practical, fast, and high-return path to more income, nutrition, and resilience for smallholders in SSA. Indigenous goats and sheep are adapted, prolific, and affordable, and with modest investment in feeding, health, and breeding, they can achieve higher growth, survival, and reproduction (Kosgey and Okeyo, 2007; Desta et al., 2023). PPR vaccination, strategic deworming, and supplementation can prevent the largest losses, and fattening for festivals can capture the highest prices. The challenge is not a lack of technology; it is the challenge of making veterinary services, feed, breeding males, and markets available to millions of smallholders, especially women who manage flocks. If that is achieved, small ruminants can turn from a low-input fallback into a reliable, profitable enterprise that lifts household income and nutrition faster than any other livestock species.

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Conflict of Interest

The authors declare no conflict of interest.

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